

ERGONOMICALLY CONDENSED QWERTY KEYBOARD

This application is a continuation of application Ser. No. 08/054,766, filed Mar. 29, 1993 now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the invention

This invention relates generally to keyboards for use with computers or typewriters and, in particular, to the key layout of a QWERTY keyboard.

2. Related Art

As a primary interface between user and machine, keyboards are an important component in the successful operation of computers and typewriters. The comfort, speed and accuracy with which data can be input using a particular keyboard are important criteria for evaluation of that keyboard's effectiveness. The size of the keyboard is also of great importance since many portable computers require keyboards of reduced size as compared to desktop computers.

The advent of notebook (measuring, in the closed position, approximately 8.5 inches by 11 inches) and sub-notebook (measuring in the closed position, approximately 5 to 7 inches by 8.5 to 10 inches) computers has created a need to minimize the size of keyboards. Keyboard size is the primary stumbling block on the path to increasingly smaller portable computers. Smaller keyboards that do not sacrifice the comfort and speed capacity associated with conventionally sized keyboards are needed for these computers.

Additionally, keyboard makers have known for some time that keyboards can cause injury if used for protracted periods of time. In particular, carpal tunnel syndrome, a condition in which the tendons in the hand swell from overuse and misuse, has received much public attention in recent years. The incidence of this condition has increased as the use of computers becomes an integral part of the daily activities of more and more workers. The increase in keyboard related injuries has provided motivation to develop ergonomically improved keyboards.

The standard keyboard key layout is referred to as "QWERTY" (so named because of the order of the alphabetical keys in the upper left corner of the key layout). FIG. 1A shows a QWERTY keyboard layout 110 with four rows of primarily alphanumeric keys. FIG. 1B shows the home row keys 100 of QWERTY keyboard layout 110. The home row keys 100 include two sets of keys 101a, 101b (the primary home row keys) above which a typist's fingers are typically oriented (i.e., a first set 101a consisting of the 'A', 'S', 'D', 'F' keys and a second set 101b consisting of the 'J', 'K', 'L', ';' keys). The remaining home row keys are 'G', 'H' and ' '.

FIG. 1C shows a keyboard 140 with an extended keyboard layout 120 including the QWERTY keyboard layout 110 and a variety of specialized function keys, e.g., F4 key 121. Note that the keys of the extended keyboard layout 120 are arranged in horizontal rows across the length of the keyboard 140.

In the key layouts shown in FIGS. 1A, 1B and 1C, each key is shown as contacting adjacent keys along the key's full length. In practice, there is typically some spacing between keys; however, for purposes of illustration, such an idealized representation accurately depicts the relationship between keys.

Referring to FIG. 1B, the interkey spacing 150 is measured as the distance between center points 102a, 102b of

adjacent keys in the same row. The width 151 of each key (equal to the interkey spacing 150 in this idealized representation) and height 152 are also shown in FIG. 1B.

A typical interkey spacing 150 for the keys in the QWERTY keyboard layout 110 of a full-size keyboard is 0.75 inches (1.91 cm), which is reported to be the minimum size that allows comfortable, fast, and accurate typing to be maintained. For an interkey spacing 150 of 0.75 inches (1.91 cm), a total interkey spacing 160 of the home row keys 100 of the QWERTY keyboard layout 110 is 7.5 inches (19.1 cm) and total width 161 of home row keys 100 is 8.25 inches (21.1 cm).

A full-size keyboard with an extended keyboard layout 120 (FIG. 1C), in which the keys in the QWERTY keyboard layout 110 have an interkey spacing 150 of 0.75 inches (1.91 cm), typically has a width 155 of 11–11.5 inches (27.9–29.2 cm) and a height 156 of 5–5.5 inches (12.7–14.0 cm). Height 156 and width 155 are undesirably large for the current generation of subnotebook computers.

One approach used to make smaller keyboards is simply to reduce all dimensions of the keys by a given amount. For example, a reduced size keyboard made by Poquet Computer, now Fujitsu Personal Systems, has an interkey spacing 150 (FIG. 1B) of 0.6 inches (1.52 cm). This reduces the total interkey spacing 160 of the home row keys 100 to 6.0 inches (15.2 cm). As a result, width 155 (FIG. 1C) is reduced to approximately 8.31 inches (21.1 cm) and height 156 is reduced to 4 inches (10.2 cm). While this approach does indeed produce a smaller keyboard 140, the reduced interkey spacing 150 makes it difficult to type quickly, accurately and comfortably.

In another keyboard having reduced key dimensions, the Gateway 2000 Handbook, the interkey spacing 150 is 0.70 inches (1.78 cm). Thus, the total interkey spacing 160 of the home row keys 100 is 7.0 inches (17.8 cm) and the width 155 is reduced (as compared to a full-sized keyboard) to 9.75 inches (24.8 cm).

In addition to the problem of size, the ergonomic properties of keyboard 140 are unsatisfactory. As shown in FIG. 2, when typing, forearms 201 are angled in a V-shape. Hands 203 are forced to assume an approximately parallel position with respect to each other, resulting in a slight bending of wrists 202 that, when maintained for prolonged periods, can cause discomfort. Wrists 202 would be more comfortable if hands 203 were allowed to simply continue in line with forearms 201.

In keyboard 140, the keys are arranged in straight rows. Due to the differing lengths of fingers 204, tips 205 of fingers 204 form an arc when allowed to rest naturally while hands 203 are held in typing position. To conform to the straight rows of keys of keyboard 140, fingers 204 are held in an unnatural position while they are poised to type over home row keys 100. This unnatural position causes hand discomfort and makes touch typing more difficult due to the tendency of the fingers to stray from home row keys 100 into a more natural position.

A number of approaches have been taken to improve the ergonomic characteristics of keyboard 140. In one approach, the keyboard surface underneath the wrists curls up to form a built-in wrist rest. While this approach provides support for the wrists, it does nothing to attack the ergonomic deficiencies noted above that are a consequence of QWERTY keyboard layout 110.

In another approach, the keys of QWERTY keyboard layout 110 are separated into right and left concave pads with some of the function keys, e.g., F4 key 121 moved to